AD-A084 111 ARMY ENGINEER TOPOGRAPHIC LABS FORT BELVOIR VA F/G 8/2
BIBLIOGRAPHY OF IN-HOUSE AND CONTRACT REPORTS. SUPPLEMENT 8.(U)
MAR 80 R P BARRON

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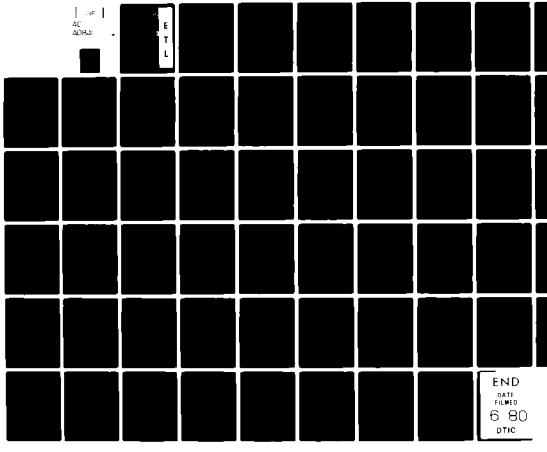

ETL-0216

12

LEVEL II

Bibliography of in-house and contract reports, supplement 8.

Rosalinda P. Barron

MAR [redacted] 80

Rpts. for 1 Jan-31

U.S. ARMY CORPS OF ENGINEERS
ENGINEER TOPOGRAPHIC LABORATORIES
FORT BELVOIR, VIRGINIA 22060

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1. REPORT NUMBER: ETL-0216 ✓ 2. GOVT ACCESSION NO. AD-A084 111	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): BIBLIOGRAPHY OF IN-HOUSE AND CONTRACT REPORTS, SUPPLEMENT 8 A068 744	5. TYPE OF REPORT & PERIOD COVERED: Bibliography, Supplement 8, 1 Jan 79 - 31 Jan 79 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): Rosalinda P. Barrón	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories ✓ Fort Belvoir, Virginia 22060	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060	12. REPORT DATE: March 1980 13. NUMBER OF PAGES: 73
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is supplement 8 to the report titled "Bibliography of In-House and Contract Reports," (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744). It is a continuing bibliography of reports prepared by and for the U. S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Virginia. This bibliography includes reports published from 1 January 1979 through 31 December 1979.

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PREFACE

This is Supplement 8 to the report titled "Bibliography of In-House and Contract Reports" (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468), (Supplement 7, AD-A068 744). It is a continuing bibliography of reports prepared by and for the U. S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, Virginia. This bibliography includes reports that were published from 1 January 1979 through 31 December 1979.

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COL Daniel L. Lycan, CE, was Commander and Director of ETL during the report preparation. Mr. Robert P. Macchia was the Technical Director.

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REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: ETL-0155	2. GOVT ACCESSION NO.: AD-A071 651
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): RADAR IMAGE SIMULATION: VALIDATION OF THE POINT SCATTERING METHOD ADDENDUM	5. TYPE OF REPORT & PERIOD COVERED: Contract Report
	6. PERFORMING ORG. REPORT NUMBER: RSL Technical Report 319-31
7. AUTHOR(s): J. C. Holtzman, J. L. Abbott, V. H. Kaupp, E. E. Komp, E. C. Davison, V. S. Frost	8. CONTRACT OR GRANT NUMBER(s): DAAG53-76-C-0154
9. PERFORMING ORGANIZATION NAME AND ADDRESS: University of Kansas Center for Research, Inc., 2291 Irving Hill Drive, Lawrence, Kansas 66045	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories, Fort Belvoir, VA 22060	12. REPORT DATE: June 1978
	13. NUMBER OF PAGES: 137
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office):	15. SECURITY CLASS. (of this report): Unclassified
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Backscatter	Plan Position Indicator (PPI)
Data Base	Simulation
Digital	Radar
Image	Reflectivity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this report is to present the additional results of applying the Point Scattering Model for radar image simulation to three (3) new cases. This work is supplemental to that previously reported[1,2]. The work was sponsored by the U. S. Army Engineer Topographic Laboratories (ETL).

The results reported were obtained for four (4) simulations corresponding to four specific altitudes in the terminal trajectory of a guided missile (three of the simulations are new), each successively lower. The sequence of

20. Continued

four simulations was tested against actual radar data of the same site via the Correlatron*. The correlation tests showed performance of simulations produced by the PSM to be acceptable in three cases, and to be unacceptable in one case. The unacceptable performance was explained by geometric errors inadvertently introduced into the data base and was not produced by the simulation method.

[1]Holtzman, J. C., V. H. Kaupp, J. L. Abbott, V. S. Frost, E. E. Komp, E. C. Davison, "Radar Image Simulation: Validation of the Point Scattering Method," Vol. I, ETL-0117, The University of Kansas Center for Research, Inc., September, 1977, AD-A053 253.

[2]Holtzman, J. C., V. H. Kaupp, J. L. Abbott, V. S. Frost, E. E. Komp, and E. C. Davison, "Radar Image Simulation: Validation of the Point Scattering Method," Vol. II, ETL-0118, The University of Kansas Center for Research, Inc., September 1977, AD-A053 240.

*Correlatron is a two-dimensional cross-correlation measuring device manufactured by Goodyear Aerospace and installed at ETL.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0159	2. GOVT ACCESSION NO. AD-A076 249	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* RADAR BACKSCATTER FROM A VEGETATED TERRAIN: A DISCRETE SCATTERING APPROACH		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Roger H. Lang Spiro Sokolakis		8. CONTRACT OR GRANT NUMBER(s) DAAK70-77-C-0142
9. PERFORMING ORGANIZATION NAME AND ADDRESS George Washington University Washington, D.C.		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161102B52CA3
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE May 1979 13. NUMBER OF PAGES 58
14. MONITORING AGENCY NAME & ADDRESS(*if different from Controlling Office*)		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Electromagnetic Wave Scattering
Random Media
Vegetation

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report studies radar backscattering from a vegetated terrain. The vegetation is modelled by spherical water droplets which can be treated as discrete scatterers. The vegetation is assumed sufficiently lossy so that the underlying ground is not noticeable. The method of Foldy is used to evaluate the mean field in the vegetation when the wavelength of the incident radiation is large compared to the droplet size. Once an equivalent dielectric constant for the vegetation is obtained by the Foldy technique, single scattering is employed to evaluate the back-scattering cross section.The resulting expression

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20. Continued

is found to compare favorably with experimental data. In addition to the three dimensional work, a one dimensional problem is analyzed. This analysis is compared with the Foldy approximation in the high density limit.

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1. REPORT NUMBER ETL-0165	2. GOVT ACCESSION NO. AD-B041 663L	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* MULTISPECTRAL TARGET SIGNATURES		5. TYPE OF REPORT & PERIOD COVERED Final Report July 1977--July 1978 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Nancy Lytle Sandra Wenderoth		8. CONTRACT OR GRANT NUMBER(s) DAAK-70-77-C-0133
9. PERFORMING ORGANIZATION NAME AND ADDRESS Spectral Data Corporation 112 Parkway Dr. So Hauppauge, NY		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE September 1978 13. NUMBER OF PAGES 71
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Military Target/Background Spectra
Multispectral
Scattering

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report presents the effects of illumination and atmospherics upon the inherent spectra of targets and backgrounds. Filter bands are selected which optimize detection of military targets embedded in the environment.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0167	2. GOVT ACCESSION NO. AD-B041 800L	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) EVALUATION AND TEST OF A SELF CONTAINED VEHICLE LAND NAVIGATION SYSTEM		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) T. J. Rickords		8. CONTRACT OR GRANT NUMBER(s) DAAK70-77-C-0205
9. PERFORMING ORGANIZATION NAME AND ADDRESS Litton Guidance and Control Systems 5500 Canoga Ave. Woodland Hills, CA 91364		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE Aug 1979 13. NUMBER OF PAGES 109
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Land Navigation System
Strapdown

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A low cost, self contained vehicle navigation system was conceived and developed. It utilizes a single gyro and accelerometer, and an odometer in a semi-strapped down configuration. Under this program, the system was tested in a van type vehicle. Performance (0.4% of distance traveled) was satisfactory over level, paved roads. However, for operation over rough and hilly terrain, design changes are needed to improve the performance.

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1. REPORT NUMBER: ETL-0168	2. GOVT ACCESSION NO.: AD-A064 800
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): DIGITAL CARTOGRAPHIC STUDY AND BENCHMARK	5. TYPE OF REPORT & PERIOD COVERED: Final Technical Report, 4 Jun 1975 -- Oct 1978
	6. PERFORMING ORG. REPORT NUMBER: 76003-78-R6
7. AUTHOR(s): D. J. Panton, M. E. Murphy, D. S. Hanson	8. CONTRACT OR GRANT NUMBER(s): DAAG53-75-C-0195
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Control Data Corporation, 2800 East Old Shakopee Road, Minneapolis, Minnesota 55420	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories, Fort Belvoir, VA 22060	12. REPORT DATE: December 1978
	13. NUMBER OF PAGES: 274
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office):	15. SECURITY CLASS. (of this report): Unclassified
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Automated Mapping	Distributive Computing
Analytical Photogrammetry	Image Correlation
Digital Image Processing	Image Matching
Digital Stereo Mapping	Parallel Processing
Digital Terrain Elevation Data Collection	Stereo Compilation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A flexible algorithm has been developed to meet the changing requirements for generating terrain data from digital stereo sensor records. The algorithm includes an image matching procedure in which parallax components are determined by automatically correlating conjugate image features. The algorithm is adaptive and can handle various types of sensor and natural terrain conditions. Reliability monitoring of the output terrain data is performed on the basis of the in-process analysis of local image areas. The reliability measure dictates various strategies that the algorithm can apply

20. Continued

in image areas where automatic correlation is difficult.

The algorithm was implemented on a distributive network of parallel digital processors. In this system, production speed is attained because of the inherent parallelism of the modular processors. Flexibility is maintained because the processors are microprogrammable. In this way, new sensor imaging characteristics and new algorithm strategies can be incorporated without disturbing the fundamental software and hardware structure of the system. Production times for compiling a representative stereo model on this parallel configuration far exceed the capability of general-purpose computers.

Based on the benchmark implementation, a production system has been designed which incorporates a full interactive image display capability. This allows an operator to interactively monitor, control, and edit the stereo compilation processes by means of a stereo CRT display, keyboard, and trackballs.

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1. REPORT NUMBER ETL-0169	2. GOVT ACCESSION NO. AD-A071 741	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) A REPORT ON ATMOSPHERIC OBSTRUCTIONS TO VISIBILITY. VOLUME I - Study Results		5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER RC 168-001
7. AUTHOR(s) Victor J. Lujetic		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0109
9. PERFORMING ORGANIZATION NAME AND ADDRESS RAMCOR, Inc. 800 Follin Lane Vienna, VA 22180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 112
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Absorption	Lights	Visibility
Atmospheric	Meteorological	Visibility Instruments
Atmospheric Obstructions	Meteorological Range	Visual Detection
Attenuation Coefficients	Reflectance	Visual Range
Contrast	Scattering	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The aims and objectives of this report were to collect and assimilate information and synthesize data on the effects of atmospheric obstructions to visibility for the non-specialist. The following areas were addressed:

A general discussion of the visible wavelengths, overall electromagnetic spectrum, radiometric and photometric quantities and concepts, and other visibility parameters.

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The human eye, nature of visibility, and the atmospheric effects on detection range.

A description of those obstructions to visibility as listed in the Federal Meteorological Handbook on surface observations.

A description of the primary visual instruments.

The practicality of developing techniques that could be used to determine the effects of atmospheric obstructions on visibility and some typical charts and graphs.

A summary of the extensive literature search performed.

REPORT DOCUMENTATION PAGE

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1. REPORT NUMBER: ETL-0170	2. GOVT ACCESSION NO.: AD-A071 742
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE (and Subtitle): A REPORT ON ATMOSPHERIC OBSTRUCTIONS TO VISIBILITY. VOLUME II - Results of Literature Search	5. TYPE OF REPORT & PERIOD COVERED: Final Report
	6. PERFORMING ORG. REPORT NUMBER: RC 168-001
7. AUTHOR(s): Victor J. Lujetic	8. CONTRACT OR GRANT NUMBER(s): DAAK70-78-C-0109
9. PERFORMING ORGANIZATION NAME AND ADDRESS: RAMCOR, Inc. 800 Follin Lane Vienna, VA 22180	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060	12. REPORT DATE: March 1979
	13. NUMBER OF PAGES: 79
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Absorption	Lights	Visibility
Atmospheric	Meteorological	Visibility Instruments
Atmospheric Obstructions	Meteorological Range	Visual Detection
Attenuation Coefficients	Reflectance	Visual Range
Contrast	Scattering	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The aims and objectives of this report were to collect and assimilate information and synthesize data on the effects of atmospheric obstructions to visibility. A large part of the total study effort involved an extensive literature search and compilation of a reference and abstract bibliography related to atmospheric effects on visibility. This Volume II includes both the extensive bibliography and abstracts of selected publications related to atmospheric obstructions to visibility and related topics. The information contained in this volume was oriented to the non-specialist.

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READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: ETL-0171	2. GOVT ACCESSION NO.: AD-A071 751
3. RECIPIENT'S CATALOG NUMBER:	
4. TITLE *(and Subtitle)*: BIBLIOGRAPHIC LITERATURE SEARCH CONCERNING THE RELATIONSHIP BETWEEN SOILS AND PLANTS IN ARID AND SEMI-ARID REGIONS IN NORTH AMERICA	5. TYPE OF REPORT & PERIOD COVERED: Contract Report
	6. PERFORMING ORG. REPORT NUMBER:
7. AUTHOR(s): Michael Inglis, Denise Glore, Lynn Price	8. CONTRACT OR GRANT NUMBER(s): DAAK 70-78-M-3292
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Technology Application Center, University of New Mexico, Albuquerque, NM 87131	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:
11. CONTROLLING OFFICE NAME AND ADDRESS: U. S. Army Engineer Topographic Laboratories, Fort Belvoir, VA 22060	12. REPORT DATE: December 1978
	13. NUMBER OF PAGES: 393
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Arid/semi-arid climates	Plant indicator(s)
Bibliography	Plant/soil water relationships
Environmental factors	Soils
Phytogeography	Vegetation

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A review of 79 journals, professional papers, and other periodicals for the period January 1950 through 1978, identified approximately 400 published references pertaining to plant species or plant communities as indicators of general or specific environmental conditions in the arid and semi-arid regions of the southwestern United States. A matrix illustrating the vegetation/factor inter-relationship(s), and the reference describing the relationship(s) was produced for easy recognition and accession of specific abstracts provided.

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1. REPORT NUMBER ETL-0172	2. GOVT ACCESSION NO. AD-A076 342	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) INTERACTIVE DIGITAL IMAGE PROCESSING INVESTIGATION		5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) W. C. Rice J. S. Shipman R. J. Spieler		8. CONTRACT OR GRANT NUMBER(s) DAAK70-77-C-0166
9. PERFORMING ORGANIZATION NAME AND ADDRESS International Business Machines Corporation 18100 Frederick Pike Gaithersburg, Maryland 20760		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE December 1978 13. NUMBER OF PAGES 175
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16. DISTRIBUTION STATEMENT (of this Report)

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Classification	Pattern recognition
Digital image processing	Photogrammetry
Feature extraction	Remote sensing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The objective of this investigation was to develop an interactive software package of general utility that can be used to suppo experiments and evaluate a class of interactive/automatic digital techni ues whose goal is feature extraction/exploitation. The initial task was to survey and select techniques, algorithms and supporting functions that were to be included in the system. A maximum likelihood supervised classification algorithm, and an unsupervised classification (clustering) method based on the ISODATA algorithm were selected. These and the associated support and evaluation functions were

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20. Continued

developed and implemented on the ETL Digital Image Analysis Laboratory (DIAL). Testing of the system was accomplished by performing experiments on areas for which both multi-dimensional images and ground truth were available. Analysis of experimental results validated the system. These experimental results were in good agreement with ground truth and further, supervised and unsupervised classification results were in substantial agreement. This report describes the data processing algorithms/techniques, software system, user guide information, and the experiment procedures used along with their results.

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1. REPORT NUMBER ETL-0173	2. GOVT ACCESSION NO. AD-A080 355	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* STAR PATTERN RECOGNITION AND SPACECRAFT ATTITUDE DETERMINATION		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) John L. Junkins Thomas E. Strikwerda L. Glenn Kraige		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0038
9. PERFORMING ORGANIZATION NAME AND ADDRESS Virginia Polytechnic Institute and State Univ. Engineering Science and Mechanics Department Blacksburg, Virginia 24061		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE October 1978 13. NUMBER OF PAGES 59
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Attitude determination
CCD
Kalman filter
microcomputer
navigation
spacecraft

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A new strapped-down system for on-board, real-time spacecraft attitude determination is discussed. The electro-optical system is capable of sub-tenarc second precision with no moving parts. The light-sensitive element is an array-type Charged Coupled Device (CCD) having about 2×10^5 silicon pixels. Parrellel, high speed analog circuits scan the pixels (row by row) to locate and A/D convert only those pixel response values (about 100 to 200 per scan) about a preset analog threshold. Angular rate measurements from conventional rate gyros are used to estimate motion continuously. Three intermittently communicating

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20. Continued

microcomputers operate in parallel to perform the functions: (i) star image centroid determination, (ii) star pattern identification and discrete attitude estimation (subsets of measured stars are identified as specific cataloged stars), (iii) optimal Kalman attitude motion estimation/integration. The system is designed to be self-calibrating with provision for routine updating of interlock angles, gyro bias parameters, and other system calibration parameters. For redundancy and improved precision, two optical ports are employed. This interim report documents Phase I of a three phase effort to research, develop, and laboratory test the basic concepts of this new system. Included in Phase I is definition, formulation, and test of the basic algorithms, including preliminary implementations and results from a laboratory microcomputer system.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0175	2. GOVT ACCESSION NO. AD-A071 723	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) LAND COVER CLASSIFICATION FROM LANDSAT DATA: PHASE III OF A JOINT OCE/NASA DEMONSTRATION		5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Richard N. Foreman		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office) Corps of Engineers Remote Sensing Committee HQDA (DAEN-CWM) Forrestal Bldg. Washington, DC 20314		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aerial Photography	Land Cover	Corps of Engineers
Digital Analysis	LANDSAT	NASA
Environmental Information		Multispectrol Scanner Data
ERTS		

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Corps of Engineers and NASA's Earth Resources Laboratory conducted a joint demonstration of the production of land cover classification data from LANDSAT data. This report describes Phase III of the demonstration, in which classification maps and data were produced for two Corps of Engineer District Wilmington District, an area in the upper Roanoke River basin of Virginia; and Jacksonville District, an area along the route of the Cross Florida Barge Canal. The report includes the Districts' evaluations of the accuracy and applicability of the classifications and cost information for Phase III of the demonstration.

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20. Continued

The report also includes cost information for the application of interdisciplinary analysis of aerial photography as a means of obtaining land cover and environmental data.

LANDSAT data may be cost-effective for identifying and showing the distribution of general types of land cover for large areas, although some land cover types may not be identifiable on a particular LANDSAT scene. Interdisciplinary analysis of aerial photography identifies and explains in a technical report the distribution of land cover. The extra detail of the report and the ability to ensure that specific land cover types are studied may make interdisciplinary analysis of aerial photography cost-effective for limited study areas.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0176	2. GOVT ACCESSION NO. AD-A066 944	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* INFERENTIAL TECHNIQUES FOR SOIL DEPTH DETERMINATIONS, PART II: ARTEMISIA FILIFOLIA TORR. (Sand Sagebrush)		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Miklos Treiber Alan E. Krusinger		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161102B52C
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 29
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18. SUPPLEMENTARY NOTES		
19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*		

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*
The objective of this work was to determine the reliability of a desert shrub, ARTEMISIA FILIFOLIA (Sand Sagebrush) as an indicator of soil depth. Near Lake Powell, Arizona/Utah; Hurricane, Utah, and St. George, Utah, more than 480 siol-depth-to-bedrock measurements were made in A. FILIFOLIA communities, in transitional, mixed communities, and in adjacent plant communities that did not contain A. FILIFOLIA. It was learned that the presence of ARTEMISIA FILIFOLIA reliably indicates that the depth of the soil mantle over the bedrock is greater than 1 meter.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0177	2. GOVT ACCESSION NO. AD-A072 628	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) INVESTIGATIONS OF THE USE OF CONVENTIONAL FILMS IN THE ETL CARTOGRAPHIC EBR		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER 4006
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s) DAAK70-77-C-0163
9. PERFORMING ORGANIZATION NAME AND ADDRESS Image Graphics, Inc. 107 Ardmore Street Fairfield, CT 06430		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 41
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Electrical Characteristics of Film
Film Charging
Electron beam recording film
Film Conductivity

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Conventional photographic films sensitive to electrons may be used in the ETL Cartographic EBR provided that image distortions caused by deflection of the electron beam due to electric charge accumulation on the film is within acceptable limits. Various techniques for minimizing film charging problems were investigated and practical solutions are discussed.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0178	2. GOVT ACCESSION NO. AD-A068 715	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* TERRAIN ANALYSIS PROCEDURAL GUIDE FOR VEGETATION (Report No. 1 in the ETL Series on Guides for Army Terrain Analysts)		5. TYPE OF REPORT & PERIOD COVERED Special Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Jeffrey A. Messmore Theodore C. Vogel Alexander R. Pearson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS MGI Data Processing and Products Division U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A762707A855
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 208
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Factor Mapping	Terrain Analysis
Remote Sensing	Thematic Mapping
Photo Interpretation	Vegetation

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This procedural guide provides the U.S.Army Terrain Analyst with the necessary step-by-step procedures to be used in generation of vegetation factor overlays and supportive data tables. Three potential sources of information on vegetation are considered: (1) military topographic maps, (2) literature, and (3) aerial imagery. Procedures are presented for each of 13 data elements that characterize vegetation of the geographic area of interest. The included appendixes provide the Terrain Analyst with additional reference information.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0179	2. GOVT ACCESSION NO. AD-A068 747	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Analysis, Storage and Retrieval of Elevation Data With Applications to Improve Penetration		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Allen Klinger		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Computer Sciences Laboratory US Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS R3205
11. CONTROLLING OFFICE NAME AND ADDRESS US Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE March 1979 13. NUMBER OF PAGES 15
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

mapping	storage
elevation data	retrieval
contour maps	trajectory
guidance penetration	tree structure

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A method to use terrain elevation data for guidance is presented. Tree structure representation of contour trend data over regions is the basis of the method. Regions of different sizes obtained by quartering given elevation matrices are used; region size corresponds to tree position.

Two computer functions are discussed: analysis methods to use tree-structered contour-trend information, suitable for onboard inflight computations; and storage reduction methods to present elevation data as a

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new digital mapping product (tree-structured contour-trend data), computable off-line on the USAETL Computer Sciences Laboratory STARAN array processor.

Six figures detailing the analytic and data storage concepts discussed are given. An example illustrating the improved penetration possible from these methods is presented.

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1. REPORT NUMBER ETL-0180	2. GOVT ACCESSION NO. AD-A068 744	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) BIBLIOGRAPHY OF IN-HOUSE AND CONTRACT REPORTS, SUPPLEMENT 7		5. TYPE OF REPORT & PERIOD COVERED Bibliography, Supplement 7 1 Jan 78 - 31 Dec 78
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) E. James Books		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This is supplement 7 to the report titled "Bibliography of In-House and contract reports," (AD-877 653L), (Supplement 1, AD-890 066L), (Supplement 2, AD-905 548L), (Supplement 3, AD-B005 275L), (Supplement 4, AD-B010 642L), (Supplement 5, AD-B019 966L), (Supplement 6, AD-A055 468). It is a continuing bibliography of reports prepared by and for the U.S. Army Engineer Topographic Laboratories (USAETL), Fort Belvoir, VA. This bibliography includes reports published from 1 January 1978 through 31 December 1978.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0181	2. GOVT ACCESSION NO. AD-A071 752	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* INVESTIGATION OF LINEAR TRANSFORMATIONS FOR AUTOMATIC CARTOGRAPHIC ANALYSIS		5. TYPE OF REPORT & PERIOD COVERED Final 4/78 -- 4/79 6. PERFORMING ORG. REPORT NUMBER TA - 79 - 1 - 1
7. AUTHOR(s) R. L. Pickholtz M. Movahed S. S. Murty		8. CONTRACT OR GRANT NUMBER(s) DAAK 70 - 78 - C - 0045
9. PERFORMING ORGANIZATION NAME AND ADDRESS Telecommunications Associates 3613 Glenbrook Rd Fairfax, VA 22031		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 6.11.02A 4A16110 2B52C 1852CS20012
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979 13. NUMBER OF PAGES 182
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Cartography
Image Analysis
Transforms

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report contains a summary of the investigation in applying linear transforms such as Fourier, Bessel, Walsh-Hadamard, Slant and Discrete Cosine to cartographic analysis. Recommendations are made and hardware and software implementations are proposed.

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1. REPORT NUMBER ETL-0182	2. GOVT ACCESSION NO. AD-A071 526	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) DESIGN OF AN EXPERIMENTAL PROGRAM FOR EVALUATION OF LBR SYSTEMS		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Dr. N. Balasubramanian		8. CONTRACT OR GRANT NUMBER(s) DAAK 70-78-C-0125
9. PERFORMING ORGANIZATION NAME AND ADDRESS Bala P. O. Box 884 Cupertino, CA 95014		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979 13. NUMBER OF PAGES 55
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

LBR Design
LBR Testing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Design and characteristics of an experimental laser beam recording system (LBR) is presented. The experimental LBR has a scanning subsystem serving both as an image sampler and an image recorder. Specific recommendations for an experimental program are outlined to evaluate EBR parameters and trade offs for selected applications.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0183	2. GOVT ACCESSION NO. AD-A080 909	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) DECISION PATH APPROACH TO GUIDANCE FOR CLIMATIC ENVIRONMENTAL TEST PLANNING (MIL-STD-810C)		5. TYPE OF REPORT & PERIOD COVERED Technical Report 1 Oct 1978 - 1 May 1979 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) J. W. Hamilton S. Cohen		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0026
9. PERFORMING ORGANIZATION NAME AND ADDRESS ManTech of New Jersey Corporation 6110 Executive Boulevard Rockville, Maryland 20852		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979 13. NUMBER OF PAGES 132
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Logic Tree	Test Parameters	Multi-Factor Test	Life Cycle Profile
Logic Path	Human Factors	Synergistic Effects	Environmental Factor
Decision Path	Test Methods	Evaluation Criteria	Environmental Testing
Test Guidance	Test Planning	Composite Exposure Sequence	
Test Design	Single-Factor Test	Climatic Environmental Profile	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The decision path method developed in this report provides a step-by-step logical approach to guidance for users of MIL-STD-810C. The method comprises systematic procedures for characterizing items of materiel and defining environments prior to designing tests. It is equally applicable as a general approach to all climatic environmental tests and as a specific approach to each climatic environmental test method in the Standard. Use of this approach should contribute to a better understanding of the MIL-STD's purpose, enhance its utility, and promote better correlation of test results.

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1. REPORT NUMBER ETL-0184	2. GOVT ACCESSION NO. AD-A076 109	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) FOURIER TRANSFORM AUTOCORRELATION		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Michael M. McDonnell		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Research Institute U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161101A91D
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979 13. NUMBER OF PAGES 33
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Fourier Transform
Optical Processing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report describes a device which can take a complete Fourier transform of the intensity transmittance of a photographic transparency. The transform is taken by purely optical means. A complete system analysis is presented, and some results of experiments with the device are described.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0185	2. GOVT ACCESSION NO. AD-A076 110	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* SIGNAL SIGNATURES OF TOPOGRAPHIC FEATURES USING ANALOG TECHNOLOGY		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Pi-Fuay Chen William W. Seemuller		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161101A91D
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Topographic Feature Extraction,
Orthogonal Functions
Solid State Sensor Arrays
Walsh Transforms

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)* Signal signatures and signatures of various spectral decompositions of selected topographic features, such as line roads, road intersections, and rectangular buildings, were developed by using analog signal processing techniques. The signal signatures were constructed in the spatial domain, and the corresponding signatures of various spectral components were obtained in the Walsh transform domain. An electronic system for generating two-dimensional Walsh functions for decomposition of topographic features was designed and built. A scheme for detecting the decomposed spectral components using an analog processor was presented.

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1. REPORT NUMBER ETL-0186	2. GOVT ACCESSION NO. AD-A076 566	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) FEASIBILITY OF USING OPTICAL POWER SPECTRUM ANALYSIS TECHNIQUES FOR AUTOMATIC FEATURE CLASSIFICATION FROM HIGH RESOLUTION THERMAL, RADAR, AND PANCHROMATIC IMAGERY		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER KS 77-370 MS 79-404
7. AUTHOR(s) Harvey L. Kasdan		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0019
9. PERFORMING ORGANIZATION NAME AND ADDRESS Recognition Systems, Inc. 15531 Cabrito Road Van Nuys, CA 91406		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE June 1979 13. NUMBER OF PAGES 182
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Optical Power Spectrum Analysis
Terrain Classification
Panchromatic Imagery Processing
Radar Imagery Processing
Thermal Imagery Processing
Coherent Optics
Optical Processing

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The objective of this study was to determine experimentally the feasibility of using optical power spectrum analysis techniques for automatic topographic feature classification from high resolution radar, panchromatic and thermal imagery. A data base of radar, panchromatic and thermal imagery was assembled. Radar and panchromatic imagery were available over the same geographical area with the same scale and perspective. An optical power spectrum data base of 6,216 individual aperture samples from the three types of imagery was collected. Included in this data base were samples over the same area with

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20. Continued

different aperture sizes. Feature analysis and decision software required in addition to standard FACEL routines was developed. Using this software, features and a decision rule were developed for radar imagery that achieved 90% correct classification of four classes of terrain. A quantitative statistical analysis was performed to determine the effects of aperture and sensor type on the performance of the optical power spectrum based features. In addition, a qualitative analysis was performed in order to present examples that illustrate signature differences between radar and panchromatic imagery.

The following general conclusions were drawn from this study:

(1) There are statistically significant performance differences for optical power spectrum based algorithms for radar, panchromatic and thermal sensors.

(2) No statistically significant trend is evident associating better or worse performance as aperture size increases that is independent of the imagery type.

(3) For a given type of imagery, there is a statistically significant variation in decision performance that depends on aperture size.

(4) For the samples used in this study, the single best sensor is radar. It is presumed that this is because of the greater texture variations present in radar imagery compared to panchromatic or thermal.

(5) No single sensor performs best for all classes. The results of this study would lead to the following choices for the detection of particular terrain types:

a. Urban - panchromatic

b. Water - radar or panchromatic

c. Agriculture - radar

d. Forest - thermal or radar

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0187	2. GOVT ACCESSION NO. AD-A076 266	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) CONCEPT DEVELOPMENT OF AUTOMATIC INSTRUMENTATION FOR MONITORING MOVEMENTS OF DAMS		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Joel B. Smith Sharon McAllister		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0218
9. PERFORMING ORGANIZATION NAME AND ADDRESS New Mexico State University P. O. Box 3-PSL Las Cruces, New Mexico 88003		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE May 1979 13. NUMBER OF PAGES 41
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Automatic Monitoring
Dam Safety
Deformation
Precise Survey

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A study was undertaken to determine a method or methods for monitoring movements of large concrete dams. A fully automated instrument system based on this method was to be designed for use in dam failure monitoring.

A literature search for possible methods and comparision of capabilities including atmospheric refraction error modeling of optical systems lead to the selection of laser ranging as the best method for measuring dam deflection. The system developed consists of a laser range meter pointed at an array of retroflectors

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20. Continued

on the dam by a computer controlled azimuth-elevation instrumentation mount. The computer also handles data collection and correction and reports to a remote terminal at the dam operator's site.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0188	2. GOVT ACCESSION NO. AD-A076 119	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) RADAR IMAGE SIMULATION OF SEASONALLY DEPENDENT REFERENCE SCENES		5. TYPE OF REPORT & PERIOD COVERED Mar 27, 78 - Sept 27, 78 Contract Report
		6. PERFORMING ORG. REPORT NUMBER RSL Technical Report 370-2
7. AUTHOR(s) J. C. Holtzman V. H. Kaupp J. A. Stiles J. E. Bare E. E. Komp V. S. Frost		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0062
9. PERFORMING ORGANIZATION NAME AND ADDRESS University of Kansas Center for Research, Inc. 2291 Irving Hill Drive Lawrence, Kansas 66045		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE April 1979
		13. NUMBER OF PAGES 227
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The results are reported from applying radar image simulation to produce simulated reference scenes of winter conditions for a missile guidance usage. A data base was constructed of the Watertown, New York, test site and simulated radar images were generated. The data base was prepared from historical data for an "average" winter at the test site. Simulated radar images were produced via the point scattering model and an empirical model was used for predicting the electromagnetic reflectance from the ground, its cover, and overlying snow. Copies of the simulated radar images are included.

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20. Continued

The results reported were obtained for four (4) simulations corresponding to four specific altitudes in the terminal phases of the trajectory of a guided missile, each successively lower. The simulated images have been produced for testing against actual radar data of the same site via the Correlatron*. These tests have not been performed as the actual radar data have not yet been obtained.

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*Correlatron is a two-dimensional cross-correlation measuring device manufactured by Goodyear Corporation and installed at ETL.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0189	2. GOVT ACCESSION NO. AD-A076 148	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AUTOMATIC FEATURE EXTRACTION: AN ANNOTATED BIBLIOGRAPHY		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0195
9. PERFORMING ORGANIZATION NAME AND ADDRESS Logical Technical Services Corporation 311 Maple Avenue West Vienna, Virginia 22180		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE May 1979 13. NUMBER OF PAGES 404
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aerial Photographic Interpretation	Automatic Compilation
Airphoto Interpretation	Automatic Detection
Automated Cartography	Automatic Feature Extraction
Automated Map Compilation	Automatic Interpretation

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

An annotated bibliography was prepared, consisting of reports, papers, articles, proceedings, and significant collections dealing with Automatic Feature Extraction from continuous tone imagery, in order to meet the research and operational needs of workers responsible for topographic mapping and preparation of military geographic information (MGI). A listing of forty-two key words was compiled for the bibliographic search, which was limited to unclassified work conducted in the United States and abroad from 1970 to the present.

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19. Continued

Cartographic Feature Extraction
Change Detection
Color Edge Detection
Digital Image Processing
Edge Detection
Feature Recognition
Feature Selection
Feature Tracking
Geographic Data Bases
Geographic Knowledge Sources
Geologic Interpretation
Image Analysis
Image Enhancement
Image Processing
Image Science
Image Signal Processing
Image Transforms
Image Understanding
Machine Perception
Object Enhancement & Extraction
Optical Image Processing
Pattern Classification
Pattern Recognition
Picture Processing
Raster Devices
Reconnaissance Systems
Relaxation
Remote Sensing
Scene Analysis
Scene Interpretation
Scene Segmentation
Situation Recognition
Surveillance Science
Symbolization

20. Continued

Twenty-one data bases were searched, as well as other pertinent bibliographic references. Some 12,000 to 15,000 abstracts were obtained, examined, and culled. The abstracts were supplied by the author(s) or by data base editors; some abstracts were edited by project personnel for clarity or to achieve a manageable test length. The bibliographic entries are categorized in a separate index according to the specific techniques and methods being reported. The rationale for the categorization is explained. A personal author index is supplied. Collections are excluded from the author and category indexes, since the scope of this material does not lend itself to categorization.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0190	2. GOVT ACCESSION NO. AD-A076 113	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) THE USE AND CALIBRATION OF DISTANCE MEASURING EQUIPMENT FOR PRECISE MENSURATION OF DAMS (REVISED)		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Kenneth D. Robertson		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS R8IRI0003
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE June 1979 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

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17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Previous Report of same title is AD-A023 759.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Deformation
Dam Safety
Distance Measurements
Mensuration
Precise Survey

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is intended as a practical guide to land surveyors who use distance measuring equipment (DME) for making precise measurements of movements in dams and other large structures. The report consists of two parts: First, DME calibration, error sources, atmospheric corrections and correct use; Second, special techniques of trilateration and data reduction for precise mensuration on dams. This revised report contains several new sections dealing with error estimation, adjustment, and refractive index corrections.

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1. REPORT NUMBER ETL-0191	2. GOVT ACCESSION NO. AD-A070 523	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) FEATURE EXTRACTION ON THE ILLIAC IV		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER 77-15/1
7. AUTHOR(s) Richard M. Brown Marsha J. Hannah		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Institute for Advanced Computation 1095 East Duane Avenue Sunnyvale, California 94086		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 11R32050100
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE May 1979 13. NUMBER OF PAGES 33
14. MONITORING AGENCY NAME & ADDRESS(If different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Texture Extraction
Spatial Dependence Matrices
MAX-MIN Technique
Software Systems
ILLIAC IV Parallel Processor
Texture Algorithms
Digitized Aerial Images
Pixels

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

IAC has developed texture extraction programs that run on the ILLIAC IV parallel processor. It has used these programs to extract two different texture measures from 32 aerial images provided by ETL. These textures are based on the MIX-MIN technique and on the computation of spatial dependence matrices. This report provides high-level descriptions of the texture algorithms, the software system created to implement these algorithms, the test and verification efforts, and the results and conclusions.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0192	2. GOVT ACCESSION NO. AD-A072 772	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) SPATIAL LIGHT MODULATORS: TEST AND EVALUATION		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) David Casasent Sanjiv Natu		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0076
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of Electrical Engineering Carnegie-Mellon University Pittsburgh, PA 15213		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 6.27.07.A 4A762707A855 855C00007
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE July 1979 13. NUMBER OF PAGES 140
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Liquid crystal light valve
Optical data processing
Photo-DKDP
Spatial light modulators

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Real-time and reusable spatial light modulators are one of the key technological components necessary in optical data processors. The purpose of this contract is to investigate the test and evaluation procedures to be used with these new data processing devices. Specific attention was devoted to the photo-DKDP and the liquid crystal light valves.

From detailed experiments performed on the LCLV, a spatially varying sensitometry and contrast ratio and a voltage and frequency dependent sensitometry were observed. These issues were analyzed, modeled, and theoretically explained.

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Complete sensitometry, resolution, and noise test data for the photo-DKDP were also obtained. From these experiments, we found a field dependent sensitometry of the Se photo-conductor used in this SLM. This makes the dynamic performance of the device superior to its static performance but makes interframe operations such as image addition and subtraction difficult. A theoretical analysis of this issue was performed and a suggestion to decrease the field dependence by proper device doping was advanced. From these extensive experiments on individual devices, a general test and evaluation procedure for SLMs was formulated. Issues addressed were sensitometry, resolution, and noise. The appropriateness of the various test procedures for resolution and noise measurements to various specific applications were also noted.

An extensive experimental program was also completed in which the photo-DKDP SLM was used as the real-time input transducer for an optical addition and subtraction system, two optical pattern recognition correlators for text and aerial imagery, and two optical signal processors for ambiguity function computation. Comparison of the performance of the real-time SLM systems to similar systems using film as the input material and comparisons to the theoretically expected correlation output plane data were also included. In all cases, the real-time SLM system performed most accurately.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0193	2. GOVT ACCESSION NO. AD-A077 191	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) FLOODPLAIN TREE SPECIES: A BIBLIOGRAPHIC LITERATURE SEARCH WITH ABSTRACTS		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) C. Ritchie Bell Jane Morley		8. CONTRACT OR GRANT NUMBER(s) DAAK70-79-M-2525
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of Botany University of North Carolina Chapel Hill, NC 27514		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161102B52C
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE September 1979 13. NUMBER OF PAGES 286
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

bottomlands	inundation	soil moisture
Ecology	plant ecology	tree species
environment	plant flooding	trees
flood plains	plant physiology	tolerances
flooding	riparian	water depth

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A thorough review of the scientific and technical literature for the period 1950 through the present was conducted of the soil-water relationship of 25 "bottomland" or flood plain tree species commonly found in eastern North America. The 25 tree species, and a compiled list of 110 keywords associated with the flood plain environment of these species, guided the search of 6 computerized bibliographical data bases, 9 abstract and index listings, and 67 serial publications.

A brief abstract of the 281 references found applicable to the subject topic is

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20. Continued

provided, as are the citations for 67 references of a more general nature. A matrix was generated which consists of the 25 tree species, and 13 soil and water parameters, i.e. soil texture, soil moisture, soil chemistry, water table, soil type, flooding and plant physiology, plant age, flooding frequency and season, duration of inundation, flooding depth, water oxygen, seed germination, and general flooding. The number of the literature citation was entered in the matrix to expedite the use of this literature review for a specific species-factor interaction.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0194	2. GOVT ACCESSION NO. AD-A074 439	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* CONCEPT DEVELOPMENT OF AUTOMATED IMAGE ANALYSIS		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Henning F. Harmuth		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0147
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of Electrical Engineering The Catholic University of America Washington, DC 20064		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE August 1979 13. NUMBER OF PAGES 90
14. MONITORING AGENCY NAME & ADDRESS*(if different from Controlling Office)*		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT *(of this Report)*

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17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Contour Recognition
Feature Extraction
Image Analysis
Image Classification
Image Processing

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The automated contour recognition and classification in aerial photography requires a feature of contours that is invariant to shift, rotation and scaling. General polygons are characterized by their angles and their normalized sides. The normalization of the sides may be achieved by dividing either with the longest side or with the circumference of the polygon.

For a curved contour, the simplest invariant under shift and rotation is the curvature. To make the curvature invariant to scaling, one may divide it by the largest curvature or multiply it with the length of the contour; the multiplica-

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20. Continued

tion with the length of the contour is better because of the finite resolution of photographs and equipment. The principle of contour recognition and classification based on angles and curvature is worked out for practical displays that produce square patterns, such as liquid crystal or plasma tube displays. The mechanical and electronic design for experimental equipment is carried out based on a plasma tube display with 512 x 512 resolved points.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0195	2. GOVT ACCESSION NO. AD-A076 111	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) AN EVALUATION OF CONVENTIONAL CORRELATION METHODS WHEN MATCHING INFRARED IMAGERY TO PANCHROMATIC IMAGERY		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Michael A. Crombie		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Computer Sciences Laboratory U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A762707A855
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE August 1979 13. NUMBER OF PAGES 33
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Base-height Ratio	Multiple Regression
Correlation	Panchromatic Imagery
Digital Pictures	Parallax
IR Imagery	Signal Power

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In this report, a practical method of determining parallax by matching an infrared image to a corresponding panchromatic image using conventional correlation methods is evaluated using digitized aerial images. However, from the results of the study, the method was found to be unsatisfactory.

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ETL-0196	2. GOVT ACCESSION NO. AD-A075 377	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* COLOR INK-JET DEMONSTRATION PROGRAM		5. TYPE OF REPORT & PERIOD COVERED 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0229
9. PERFORMING ORGANIZATION NAME AND ADDRESS Mead Technology Laboratories 3481 Dayton-Xenia Road Dayton, Ohio 45432		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE September 1979 13. NUMBER OF PAGES 76
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Color copier
Copier
Ink-jet
Reproduction

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

A demonstration program was conducted to evaluate the use of ink-jet imaging technology for color map reproduction. A single-color laboratory copier was modified for three-color operation by adding two additional scan towers and ink-jet arrays. Extensive ink compatibility testing was performed to insure adequate operation with the system and the high wet strength map paper. The demonstration proved that the desired resolution and geometric fidelity could be obtained. Samples with 300 line-per-inch resolution were produced. True color balance could not be achieved within the funding and schedule constraints of the program, how-

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ever, due to the breadboard nature of the device and the need for additional, individual channel controls and improved system reliability.

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1. REPORT NUMBER ETL - 0197	2. GOVT ACCESSION NO. AD-A076 203	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* MATERIALS RESEARCH FOR HOLOGRAPHIC RECORDING (REPORT NO.3, HARDENED GELATIN HOLOGRAPHIC RECORDING MATERIALS)		5. TYPE OF REPORT & PERIOD COVERED Technical Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) James W. Gladden John W. Eastes		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161102B52C
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		12. REPORT DATE September 1979 13. NUMBER OF PAGES 65
14. MONITORING AGENCY NAME & ADDRESS(*if different from Controlling Office*)		15. SECURITY CLASS. *(of this report)* Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Diazo
Diazo Gelatin
Dichromated Gelatin
Holography
Holographic Recording Materials
Photosensitive Materials
Silver Halide (Sensitized) Gelatin

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The results of a study of four different hardened gelatin holographic recording materials are reported. These are the dichromated, diazo, diazo resin, and silver halide (sensitized) gelatins. The report concludes that of the four photosensitive processes studied, the silver halide (sensitized) gelatin process offers the most promising process characteristics.

The silver halide gelatin process is a new holographic recording process that can be used to prepare phase volume holograms in hardened gelatin.

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20. Cont'd

The process uses a reversal bleach that dissolves the developed silver metal image while further crosslinking the gelatin in the vicinity of the silver image. Upon fixing and with dehydration of the resulting gelatin hologram, one obtains recordings similar to those produced by the dichromated gelatin process. This is accomplish with exposures on the order of 200 to 500 $\mu J/cm^2$ at 514.5 nm in a silver halide emulsion that has a panchromatic response. Furthermore, because the hologram has no silver halide present, the hologram does not exhibit the printout phenomena characteristic of bleached holograms.

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1. REPORT NUMBER ETL-0198	2. GOVT ACCESSION NO. AD-A076 114	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) FINITE ELEMENT MODELS OF THE EARTH'S GRAVITY FIELD PHASE IV		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) R. C. Engels, Assistant Professor J. L. Junkins, Professor, PI		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0072
9. PERFORMING ORGANIZATION NAME AND ADDRESS Department of Engineering Science & Mechanics Virginia Polytechnic Institute Blacksburg, VA 24061		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE October 1979 13. NUMBER OF PAGES 150
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Finite Element
Geodesy
Gravity
Guidance

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Methods are developed and demonstrated for constructing piecewise local models for gravity anomalies. The approach is shown to be computationally more efficient (by a factor of about 20) than competing methods. The report includes software listings and test cases.

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1. REPORT NUMBER ETL--0200	2. GOVT ACCESSION NO. AD-A076 112	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) A WEIGHTED LINE-FINDING ALGORITHM		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) K. Abdoshah A. Klinger.		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS R3205
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

picture processing
imagery
pattern recognition
line detection
edge detection
colinear points,
line--finding transformation
weighted line--finding transformation
Hough transformation
digital cartography

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This paper introduces two new algorithms to detect a line in a digitized picture. The algorithms are compared with the Hough algorithm, and their computational advantages are shown. We discuss the potential for, and the use of, the algorithms in applications, including the use of imagery in digital cartography.

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1. REPORT NUMBER ETL-0202	2. GOVT ACCESSION NO. AD-B044 152L	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TEST RESULTS OF THE LITTON LOW-COST SEMI-STRAPPED-DOWN INERTIAL LAND NAVIGATION SYSTEM		5. TYPE OF REPORT & PERIOD COVERED Technical Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Jack L. Perrin		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A762707A855
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Artillery Survey System
Elevation Determination
Land Navigation
Position Determination

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report is the test results of the Litton low-cost semi-strapped-down land navigation system. The tests were performed by ETL from 22 March 1979 to 25 May 1979. The tests were performed in a GMC van on various types of cources in northern Virginia. The purpose of the tests was to determine the potential of the systems to provide positioning information of suitable accuracy for weapon positioning and target acquisition systems.

The test results indicate that on rough roads the accuracy deteriorates below what would be acceptable.

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1. REPORT NUMBER ETL-0203	2. GOVT ACCESSION NO. AD-A075 542	3. RECIPIENT'S CATALOG NUMBER
4. TITLE *(and Subtitle)* FEASIBILITY STUDY FOR FIELD GENERATION OF INPUT FOR RADAR SCENE GENERATION FROM DLMS TERRAIN AND ELEVATION DATA		5. TYPE OF REPORT & PERIOD COVERED Contract Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s)		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0209
9. PERFORMING ORGANIZATION NAME AND ADDRESS Autometric, Inc. 5205 Leesburg Pike, Suite 1308 Falls Church, Virginia 22041		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Radar Scene Generation
Algorithm
Disc Storage
Disc Transfer
Planimetry

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report describes the feasibility of performing the conversion of data from a field deployable data base to input data for a radar scene generation algorithm in the field within a less than 10-minute period. Although the method described is not the only method, it is one which will work within the time allotted and fulfills other criteria, such as amount of disc storage required and computer power available.

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1. REPORT NUMBER ETL-0204	2. GOVT ACCESSION NO. AD-A080 729	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) PROTOTYPE IMAGE SPECTRUM ANALYZER (PISA) FOR CARTOGRAPHIC FEATURE EXTRACTION		5. TYPE OF REPORT & PERIOD COVERED Research Note 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Pi-Fuay Chen Frederick W. Rohde William W. Seemuller		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A161102B52C
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18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Cartographic Feature Extraction Plasma Discharge Devices Orthogonal Functions Walsh Transforms		

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
An electro-optical system for obtaining two-dimensional Walsh transforms of cartographic images was developed. The system uses a plasma discharge device to generate visible two-dimensional Walsh function pattern masks. The cartographic imagery is placed in contact with the plasma tube, and the product of the mask and image is integrated with a single photodetector. The system is capable of producing 512 by 512 (262, 144), two-dimensional Walsh functions, and the same number of associated Walsh transform coefficients in about 14 seconds. The quantitative measurement and display of the relative magnitude of the first

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20. Continued

block of Walsh transforms (64 x 64) was facilitated with a system minicomputer and a CRT display. A set of selected cartographic images and targets were used to evaluate the system. It was discovered that most of the significant transform information appeared in the lower order Walsh transform coefficients, and further that each Walsh transform pattern is unique in itself and can be distinguished from the others for a limited set of well defined inputs. The dynamic range, the temporal response, and the symmetry of responses of the Prototype Image Spectrum Analyzer (PISA) were found to be relatively poor.

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1. REPORT NUMBER ETL-0205	2. GOVT ACCESSION NO. AD-A080 021	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) TERRAIN ANALYSIS PROCEDURAL GUIDE FOR ROADS AND RELATED STRUCTURES (Report No. 2 in the ETL Series on Guides for Army Terrain Analysts)		5. TYPE OF REPORT & PERIOD COVERED Technical Report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Theodore C. Vogel		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Geographic Sciences Laboratory U. S. Army Engineer Topographic Laboratories Fort Belvoir, Virginia 22060		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 4A762707A855 T3 0021
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Terrain Analysis
Remote Sensing
Topography
Aerial Photography
Military Geographic Information

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides step-by-step methods and necessary procedures for obtaining information on roads and related structures, i.e. bridges, tunnels, etc., from U.S. military maps, aerial photography, and other source materials or documents. The Guide was written specifically for the U. S. Army Terrain Analyst and presents the detailed methodology necessary for obtaining approximately 15 data elements concerned with the location and mensurational characteristics of roads and related structures. It is the second in a series of guides for Army Terrain Analysts.

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1. REPORT NUMBER ETL-0206	2. GOVT ACCESSION NO. AD-A078 471	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) THE RADOT CODE SYSTEM TO CALCULATE THE RADAR RETURN FROM A FORESTED AREA		5. TYPE OF REPORT & PERIOD COVERED FINAL REPORT Contract Report
		6. PERFORMING ORG. REPORT NUMBER MAGI-7065
7. AUTHOR(s) M. O. Cohen E. S. Troubetzkoy		8. CONTRACT OR GRANT NUMBER(s) DAAK70-78-C-0158
9. PERFORMING ORGANIZATION NAME AND ADDRESS Mathematical Applications Group, Inc. 3 Westchester Plaza Elmsford, NY 10523		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Engineer Topographic Laboratories Fort Belvoir, VA 22060		12. REPORT DATE October 1979
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Branches	Radar Cross Sections
Leaves	Simulation of Forests
Matrix Code	Simulation of Trees
Radar	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

RADOT (Radar on Trees) is a system of FORTRAN computer codes designed to predict the radar return from a canopy of vegetation.

The system combines a realistic simulation of the geometry of the trees of a forest with simple approximations as to the physics of radar scattering with individual branches and leaves.

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20. Continued

Program TREE is used to generate a prototype tree, for example, an oak tree. A tree run is based upon a detailed input description and need be performed only once for each tree type. The output is a tree model, described down to the level of individual branches and leaves, which can be combined with a "library' of previously generated prototype trees, into a new library of prototypes. This new library subsequently serves as input to Program HIT, the main geometry code.

Program FORGEN, the forest generator, combines user input with built-in distribution functions to place trees throughout a simulated forest area. The tree, itself, is one of the prototypes available from the library, scaled and reoriented by FORGEN. The output of FORGEN is a forest model which contains information as to the location, size, orientation and tree type of each tree in the forest. This forest model can be saved for all subsequent analyses involving this forest.

Program HIT uses ray-tracing techniques to establish the composition of the forest as a function of height above ground. The output of HIT is a file of single scatter layers. For each layer, there is provided a complete description of the type, size, and orientation of all materials contained within. This completes the geometry portion of the RADOT system. The desired physical description of the forest is now available to MATRIX, the code which combines the geometry and microscopic physics data. The output of HIT may be saved and combined with several varieties of physics data.

The physics portion of the RADOT system is treated by Program LEABRA (Leaf, Branch). LEABRA is based upon the assumption that, for radar, each interaction with a branch or a leaf can be treated, on the local level, as an interaction with a finite, circular dielectric cylinder, or with a thin, circular, lossy disk, respectively. The physics of such interactions, and the numerical solutions of the formulations so involved, are incorporated into LEABRA. The output of LEABRA is microscopic radar differential cross sections, independent of the actual forest geometry. The output of LEABRA may be saved for future combination with several varieties of forest description.

Program MATRIX is a multi-layer matrix code which combines the geometric forest description data with the microscopic radar scattering data to determine the overall radar return of the simulated forest. In MATRIX, the single scatter layers, determined by HIT, are treated one-by-one, starting with the topmost. The physical descriptions within each layer are combined with the microscopic differential cross sections to obtain the overall transmission and reflection matrices of the layer. These layers are then successively combined, working

20. Continued

downwards toward the ground, into composite thicker layers. The transmission and reflection of the larger synthesized layers are obtained in the course of this combination process. This continues until either the ground is reached or the system converges. At this point, MATRIX provides a print-out of the determined return from the simulated forest.

It is concluded that the RADOT system of computer codes is a potentially valuable tool to predict the radar return from a canopy of vegetation. It combines highly realistic simulation of the geometry of trees of a forest with simple approximations as to the physics of radar scattering with individual branches, leaves and the ground.

To date, however, RADOT has not been tested against any field data. This would certainly be a logical next step to take in this developmental program.

REPORT DOCUMENTATION PAGE

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4. TITLE (and Subtitle): Terrain Analysis Procedural Guide for Geology (Report No. 3 in the ETL Series on Guides for Army Terrain Analysts)	5. TYPE OF REPORT & PERIOD COVERED: Technical Report
	6. PERFORMING ORG. REPORT NUMBER: NA
7. AUTHOR(s): James Tazelaar	8. CONTRACT OR GRANT NUMBER(s): NA
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Geographic Sciences Laboratory, U.S. Army Engineer Topographic Laboratories, Fort Belvoir, Virginia 22060	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 4A762707A855
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Terrain Analysis
Remote Sensing
Geology
Aerial Topography
Military Geographic Information
Topography

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides the methods and procedures necessary for obtaining information on geology from the most accessible sources, which are topographic maps and aerial photos. The report is written for the U.S. Army Terrain Analyst, and presents the detailed methodology necessary for obtaining approximately 18 Geology Data Elements useful in preparing factor overlays.

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